



**Bharat Heavy Electricals Limited
(A Govt. of India Undertaking)**

Piping Centre, 80, G. N. Chetty Road, CHENNAI – 600 017

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REF: ENQ NO: 4101100110

DT: 26.08.2011

Sub: Procurement of BW Fittings – CS, AS & SS.

Ref: Enquiry No: PC: 4101100110 dt 26.08.2011

Please find the following tender documents for reference.

1. List of items
2. Tech. delivery condition TDG: 102 Rev 04.

Pre qualification is the criteria for consideration for other than BHEL approved vendors. After qualifying for registration, the new vendors may be considered for future requirements, in line with BHEL system and policy. Such vendors will not be considered for this enquiry.

This is a limited tender and only vendors who are contacted through e-mail/courier may submit their offers. Offers from other vendors will not be considered for this enquiry.

New vendors may download vendor registration forms from BHEL web site www.bhel.com and relevant data for formal registration may please be sent to Manager, Supplier development cell, BHEL Piping centre, 80, G N Road, T. Nagar, Chennai – 600017.


Manager / Purchase
BHEL / Piping Centre
80, GN Road, T. Nagar
Chennai-600017
Ph: 044-28161243

Sl. No	Material	Description	Qty nos	Drawing. No.	cur	Unit Rate
1	921174190000	ECCREDOD762X40/558.8X28.58SA234WP22CL1	11	4-80-310-63017		
2	921175760000	RED OD 406.4X60/168.3X27.5SA234WP22CL1	2	As per Standard		
3	921175770000	RED OD 406.4 X 60/ 273 X 45 SA234WP22CL1	2	As per Standard		
4	921175930000	RED OD 762X40/ 558.8X28.58 SA234WP22CL1	26	As per Standard		
5	921176310000	BWRED 406.4X17.5/355.6X11.13SA234WP22CL1	3	As per Standard		
6	925042110000	BW LR 90DEG ELL 219.1X36SA234WP22CL1	5	As per Standard		
7	925042390000	BW LR90DEG ELL88.9X15.24SA234WP22CL1	10	As per Standard		
8	925045050000	LR 90DEG ELL 73X5.16SA234WP22CL1	60	As per Standard		
9	925057230000	BW EQT 168.3 X 27.5 SA234WP22CL1	1	As per Standard		
10	925057810000	UNEQTEOD762X40/OD558.8X28.58SA234WP22CL1	11	As per Standard		
11	925058780000	BWUNEQTEEOD457X25/406.4X25SA234WP22CL1	6	As per Standard		
12	925059120000	EQ TEE OD 762X40 SA234WP22CL1	14	As per Standard		
13	925059520000	UNEQTE406.4x17.5/355.6x11.13SA234WP22CL1	2	As per Standard		
14	925174220000	BW CON RED 88.9X15.24/73X9.53 SA234WP22	20	As per Standard		
15	925179460000	BWC.RED168.3X27.5/114.3X20 SA234WP22	1	As per Standard		
16	925244590000	LR 90DEG ELL 33.4X4.55SA234WP22CL1	100	As per Standard		
17	925246330000	BW LR 45DEG ELL406.4 X 22.2 SA234WP22CL1	15	As per Standard		
18	925249360300	BW LR 90 DEG ELL 660 X 36 SA234WP22 CL1	34	As per Standard		
19	925249370300	BW LR 45 DEG ELL 660 X 36 SA234WP22 CL1	4	As per Standard		
20	925258340000	EQT 33.4 X 6.35SA234WP22CL1	10	As per Standard		
21	921044290200	BWLR90DEGELL88.9X5.49(WITHMPI) SA234WPB	800	As per Standard		
22	921044310200	BWLR90DEGELL168.3X7.11(WITHMPI) SA234WPB	400	As per Standard		
23	921044620000	BW LR 90DEG ELL 323.9 X 9.53 SA234WPB	22	As per Standard		
24	921171170200	BW CON RED 273X9.27/219.1X8.18 SA234WPB	10	As per Standard		
25	921174270000	BWRED OD 508X 16 / 355.6 X 12.7 SA234WPB	2	As per Standard		
26	921174570000	BWCONC RED 323.9X9.53/219.1X6.35SA234WPB	10	As per Standard		
27	925041620000	BW LR 45DEG ELL 406.4 X 9.53 SA234WPB	13	As per Standard		
28	925042240000	BW SR 90DEG ELL 219.1 X 6.35 SA234WPB	12	As per Standard		
29	925043440000	BW LR 90DEG ELL 168.3 X 7.11 SA234WPC	7	As per Standard		
30	925045370000	BW LR 90DEG ELL 609.6 X 9.53 SA234WPB	65	As per Standard		
31	925045700200	BWLR90DEGELL114.3X6.02(WITHMPI) SA234WPB	302	As per Standard		
32	925046940000	BW LR 45DEG ELL 114.3 X 17.12 SA234WPC	21	As per Standard		
33	925048670000	BW SR 90DEG ELL 813X10SA234WPB(Welded)	4	As per Standard		
34	925053790000	BW UEQT 355.6X9.53 219.1X8.18 SA234WPB	2	As per Standard		
35	925057020000	BW EQT 168.3 X 21.95 SA234WPC	2	As per Standard		
36	925058750000	UNEQTEEOD219.1X32/168.3X27.5SA234WPC	3	As per Standard		
37	925174110000	BWCONRED168.3X7.11/114.3X6.02 SA234WPB	9	As per Standard		
38	925195800000	BW CAP OD 508 X 48 SA234WPC	7	As per Standard		
39	925242030500	BW LR 90DEG ELL 355.6 X 11.13 SA234WPB	32	As per Standard		
40	925242400000	BW LR 90DEG ELL 508 X 15.09 SA234WPB	5	As per Standard		
41	925242410000	BW SR90DEG ELL 914X9.53 SA234WPB(Welded)	3	As per Standard		
42	925242710000	BW LR 90DEG ELL 48.3 X 5.08 SA234WPB	270	As per Standard		
43	925242760000	BW LR 45DEG ELL 610 X 10 SA234WPB	4	As per Standard		
44	925242800000	BW SR 90DEG ELL 610 X 10 SA234WPB	20	As per Standard		
45	925243000000	BW LR 45DEG ELL 355.6 X 9.53 SA234WPB	86	As per Standard		
46	925243090000	BW LR 90DEG ELL 273 X 36 SA234WPC	8	As per Standard		
47	925243170000	BW LR 90DEG ELL 219.1 X 30 SA234WPC	80	As per Standard		
48	925243200000	BW LR 90DEG ELL 33.4 X 9.09 SA234WPC	26	As per Standard		
49	925246670000	BW LR 90DEG ELL 168.3 X 27.5 SA234WPC	7	As per Standard		
50	925249330000	BW ELBOW 45 DEG 368 X 40 SA234WPC	16	As per Standard		
51	925249810000	BW 30 DEG ELBOW OD 273 X 52 SA234WPC	15	As per Standard		
52	925249850000	BW 30 DEG LR ELBOW OD 559 X 75 SA234WPC	36	As per Standard		

Sl. No	Material	Description	Qty nos	Drawing. No.	cur	Unit Rate
53	925252170000	BW EQT 355.6 X 11.13 SA234WPB	6	As per Standard		
54	925252460000	BW UEQT 508X12.7 219.1X8.18 SA234WPB	1	As per Standard		
55	925252590000	BW UEQT 60.3X5.54 33.4X4.55 SA234WPB	22	As per Standard		
56	925255590000	BW UEQT 355.6X9.53 114.3X6.02 SA234WPB	5	As per Standard		
57	925272170000	BWCONRED355.6X11.13/323.9X9.53 SA234WPB	4	As per Standard		
58	925272360000	BWCONRED114.3X17.12/60.3X11.07 SA234WPB	1	As per Standard		
59	925272970000	BW CON RED 610X10 273X6.35 SA234WPB	4	As per Standard		
60	925273180000	BWCONRED114.3X17.12/88.9X15.24 SA234WPC	3	As per Standard		
61	925273250000	BWCONRED114.3X13.49/60.3X8.74 SA234WPC	4	As per Standard		
62	925273750000	BWCONRED168.3X21.95/88.9X11.13 SA234WPC	11	As per Standard		
63	925279590000	BW CON RED 508X15.08/323.9X10.31SA234WPC	2	As per Standard		
64	925246260000	BW LR 45DEG ELL 114.3X3.05 SA403WP304H	8	As per Standard		
65	925279730500	BW RED 219.1X3.76/168.3X3.4SA403WP304H	4	As per Standard		

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1.0 CODES:-

The fittings shall meet Indian Boiler Regulations (IBR) and the following requirements in addition to the standards specified in the Purchase Order (PO).

2.0 RAW MATERIALS:-

- All pipes used for fittings shall meet the respective specification. The test certificate shall be furnished.
- All mother pipes used for fittings shall be subjected to a hydraulic test as per SA 530 or UT as per ASTM E 213 at the mill
- All plates used for fittings shall be UT tested as per S1 of SA578 and acceptance norms shall be as per Level B of SA578
- The raw material forging shall be ultrasonically tested as per SA 388 and the acceptance norm shall be as per 3.3.4 of ASME Sec VIII Div 2.
- Steel for SA182 F11, F12 & F22 if indigenously procured, to be from following manufacturers approved under IBR for creep resistant steels: i) Alloy Steel Plant Durgapur, ii) Tata Iron & Steel company, Jamshedpur & iii) Mahindra Ugine Steel Company, Mumbai.
- Carbon content of SA 234 WPB, WPC, SA 105 fittings shall be restricted to 0.25% max

3.0 PROCESS:-

- Process of manufacture shall conform to applicable standards.
- All fittings shall be of seamless unless otherwise specified in the purchase order.
- In case of welded fittings, WPS, PQR & welder qualification shall be approved by BHEL - PC, prior to start of welding.
- All fittings shall have smooth surfaces, workman like finish and free from loose scales and defects like laps, seams, folds, cracks, pitting etc.. Repair by welding is NOT permitted.
- Dimensions shall be as per ASME B16.9 or B16.28, Butt Weld edges shall be as given in Purchase Order. The ends of reducers shall have a straight portion of Minimum 13mm.
- Unless otherwise specified in the P.O SA 234 WP 11/12/22 fittings shall be supplied as per class 1, SA 182 F11/12 shall be supplied as class 2, SA 182 F22 shall be of class 3 only .

4.0 HEAT TREATMENT:-

4.1 All fittings shall be heat treated as below.

SA 234 WP B	- As per specification
SA 105, SA234 WP C	- Normalised
SA234 WP11/ WP12/ WP22	- Normalised & Tempered
SA182 F11/ F12/ F22	- Normalised & Tempered
Stainless Steel :-	
SA 182 F304/ 316/ 321/ 347	- Solution annealed
SA 403 WP304/ 316/ 321/ 347	- Solution annealed

4.2 Fittings conforming to SA 234 WP91 and SA182 F91 shall be normalised at 1040 to 1070 deg C (for wall thickness larger than 75 mm, accelerated cooling may be done to obtain a fully martensitic structure) and tempered at 760 ± 10 deg C

5.0 TESTING :-

- All ferrous fittings shall be tested by MPI as per ASTM E-709 and SS fittings shall be LPI tested as per ASTM E 165.

S. Jayakumar, Engg

P. Elangovan, QA

Approved by

K. Vedaprasad, QC

K. Ganeshan, MPL



- (b) One fitting of each specification, heat, heat treatment lot and size shall be subjected to Tension Test as per applicable standard.
- (c) All fittings of wall thickness above 6mm or NB 200mm and above shall be Ultrasonically Tested as per SA 388; acceptance norms shall be 3.3.4 of ASME section VIII Div.2.
- (d) Hardness test shall be carried out on each fittings of WP91 / F91. For other fittings hardness shall be checked on 10% of the fittings.
- (e) In case of welded fittings; all the welds shall be 100% RT tested and acceptance norms shall be UW 51 of ASME Sec VIII DIV-1
- (f) The following supplementary tests shall be carried out for specifications namely SA105, SA 182 F11 / F12 / F22 / F91, SA 234 WPC / WP11 / WP12 / WP22 / WP91 (No supplementary test applicable for SA 234 WPB)
 - a) Product analysis – one / heat / size.
 - b) Tension test – one / heat / heat treatment lot / size.
- (g) Metallography:- Metallography shall be carried out on one per heat, per size, per heat treatment lot of WP91 / F91 fittings. Acceptance norms - The Material shall be free from any micro fissures. Microstructure shall show tempered martensite and also to be examined for any grain growth. Photomicrograph with 500x (Min) magnification along with Metallography report to be provided. The actual magnification shall be indicated.

6.0 POSITIVE MATERIAL IDENTIFICATION (PMI) FOR ALLOY STEEL FITTINGS.

Each alloy steel fitting shall be checked for the correctness of the material during manufacturing and final inspection using X-ray fluorescence principle or spark emission spectrography.

7.0 PAINTING , COLOUR CODING, MARKING, PACKING & END PROTECTION

7.1 **PAINTING** : All fittings (except stainless steel and galvanised) shall be painted on the external surface as given below

- a) surface preparation : Blast cleaning
 - b) Primer coat : 50 microns of Red oxide zinc phosphate confirming to IS 12744
 - c) Final coat : 70 microns of Synthetic enamel paint confirming to IS2934 .
 - d) Shade : (i) smoke grey – shade no 692 of IS5 for all carbon steel fittings
(ii) Sea green -- shade no 217 of IS5 for all Alloy steel fittings
- The internal surface shall be protected with rust preventive coating or rust inhibitor. Stainless steel and Galvanised fittings need not be painted.

7.2 **COLOUR CODING** : All fittings shall be colour coded circumferentially at ends as given below

SA 234 WPB / WPBW	=	Red
WPC / SA105	=	Blue

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WP11 / SA182 F11	=	Green & White
WP12 / SA182 F12	=	Black & Red
WP22 / SA182 F22	=	Blue & Red
WP91 / SA182 F91	=	Brown & Red
SA182 / SA 403 F / WP 304	=	Blue & Yellow
316	=	Black & Green
321	=	Blue & Brown
347	=	Yellow & Black

7.3 MARKING :

7.3.1 The fittings dispatched to **BHEL Stores** shall be punched / etched with Material code, Heat number, material specification, maker's emblem, Inspectors seal and Statutory authorities seal (as applicable).

In addition, the above details along with size shall be paint stenciled on the fittings.

If the thickness of the fitting is less than 6 mm, punching is not permitted and the above details shall be paint stenciled only. Fittings of size up to 2" (50mm) shall be tied together and the above details shall be punched / etched in a separate tag and tied to it.

7.3.2 The fittings dispatched directly to project site as **DTS** shall be punched and paint stenciled with DU code (14 digit work order du detail) as given by purchase in addition to marking done as per para 7.3.1.

7.4 **PACKING AND END PROTECTION :** Machined ends of the fittings shall be well protected using end caps and fittings shall be suitably packed in box / crate to avoid transit & other damages.

8.0 INSPECTION & CERTIFICATION : -

All fittings are to be Inspected at the manufacturer's works by the Inspection agencies / authorities as per IBR and as indicated in the P.O. Inspection certificate in IBR Form III C shall be submitted along with the Work Test Certificate countersigned by the above authorities and shall include the following.

1. Test Certificate Number & date.
2. BHEL P.O Number & Amendment Number
3. BHEL P.O. Serial Number
4. BHEL TDC Number
5. Size-wise Quantity
6. Specification, Grade & Year of code.
7. Heat/Melt Number
8. Starting material details.
9. Steel making process
10. Laddle Analysis of Raw Material and product analysis of fitting.
- *11. Positive Material Identification (PMI) report for Alloy steel fittings.
- *12. Supplementary Test(Product analysis, Tension test..) results.
- *13. Heat Treatment Chart.
- *14. NDE report. (VISUAL.MPI, LPI,UT)
- *15. Tensile Test Report
- *16. Hardness Test Report

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- 17. Metallography Report along with photomicrograph with 500x (min) magnification.
- *18. Dimensional conformance.
- *19. RT test report / Results (for welded fittings)
- *20. Guarantee of HTP shall be given as follows:- "Fittings are capable of withstanding without failure, leakage or impairment of their serviceability a hydrostatic test pressure equal to that prescribed for the specified matching pipe of equivalent material".

*Details furnished in the Tests certificate in lieu of chart/report is acceptable.

9.0 RECORDS OF REVISION :-

Rev 01 : a) Fully revised for better clarity.

: b) Para 2.0 e added.

Rev 02 : a) Para 2.0 (c): UT acceptance norms revised from level A to B.

Rev 03 : a) Fully revised for better clarity.

: b) Para 4.2, 6.0, 8.0 (11) added.

c) Para 2 (d) , 4.1, 5 (d) are revised.

Rev 04 : a) Para 5.0 (g), 7.0 and 8.0 (17) are revised.

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